PRELIMINARY WILDLIFE ASSESSMENT OF SELECTED GAS PRODUCING COMMUNITIES IN OGBA-EGBEMA AREA OF RIVERS STATE, NIGERIA

[*]Edet, D. I. and [**]Aigbe, H. I.

[*]Department of Forestry & Wildlife Technology, Federal University of Technology, Owerri, Imo State, Nigeria. Email: daniffer2003@yahoo.com

[**]Department of Forestry & Wildlife Management, University of Port Harcourt, Rivers State, Nigeria.

ABSTRACT

The Niger Delta region of Nigeria is a beehive of oil production activities for almost fifty years. The exploration of this important resource with its attendant gas flaring has impacted negatively on biodiversity of the area. A baseline study was therefore, conducted to ascertain the level of wildlife abundance in selected communities (Obrikom, Mgbede, Ebocha, Aggah and Okwuzi all in Ogba-Egbema Local Government Area of Rivers State) impacted by gas flaring. A total of 7 transects were used for the study. Species density and diversity indices were estimated from data generated. The mammalian order Rodentia was more in abundance than other species. Two rodents, the giant-pouched rat (Cricetomys emini) and cane rat (Thryonomys swinderianus) recorded 7.336±0.0068 and 6.146±0.036 individuals/km^2 respectively. The mona monkey (Cercopithecus mona) and putty-nosed monkey (Cercopithecus nictitans) with average densities of 0.496±0.018 and 0.324±0.006 troop/km^2 are the only recorded primates in the study sites. The agama lizard (Agama agama) with average density of 0.192±0.014 individuals/km^2 was found to be more in abundance than other reptiles. Species recorded for avifauna belong to thirteen families and Ploceidae family was found to be more in abundance. Species Richness (d), Shannon-Wiener (H$'$) and Evenness (E) indices for mammals in Okwuzi were 1.821, 1.415 and 0.727 respectively and were higher than other sites. Obrikom had the highest Simpson Dominance (C) of 0.456 though not significantly different ($p \geq 0.05$) from Okwuzi. Diversity indices for reptiles showed that Obrikom and Okwuzi had the highest d, H$'$, E and C of 1.820, 1.099, 1.000 and 0.333 each respectively. Highest values of d (2.889) and H$'$ (1.835) were recorded for Obrikom while E (0.963) and C (0.355) were highest values for Okwuzi and Aggah respectively in relation to avifauna diversity. Many of the species encountered have ethno-zoological values. The findings indicate that there is loss of wildlife occasioned by anthropogenic impacts especially oil and gas exploration.

INTRODUCTION

Oil production involves the burning of hydrocarbon gases. The flaring–off of natural or associated gas is done as a by-product of the drilling of crude oil from reservoirs in which oil and gas are mixed. A higher percent of the gases are being flared, resulting in pollution of the area. In Nigeria, there are more than 1000 gas flaring points that release over 23 billion m^3 of gas per annum and this makes the country the world's biggest flarer of Associated Gas (AG), (Olukoya 2008). Due to poor infrastructure and unsustainable practices among oil companies, only 19% of the total gas flared is recovered (Evoh 2002). The Ogba-Egbema Area, an oil producing area of the Niger Delta is one of such most polluted areas in Nigeria.

The impact of gas flares on the local ecology and climate as well as peoples' health and property is evident. The flares involve the release of dangerous hydrocarbons mostly methane and others which include oxides of sulphur and nitrogen into the atmosphere. The flares raise temperature of the surrounding environment to a range of 13,000-14,000 degrees Celsius and causing noise pollution around the vicinity of the flares. The result of this unchecked emission of gases is the release of millions of tons of Carbon dioxide and methane which means that these oilfields contribute to global warming (Audu 2013), threaten biodiversity including vegetation and wildlife species, and sometimes aggravate the local extinction of species. Flaring natural gas from oil fields as a by-product of crude oil production is thus a common sight that dominates the skyline in the Niger Delta (Obadina 1999, Egbon 2014). It is the most visible impact of the oil industry on daily life. The flares have contributed more greenhouse gases than all of sub-Saharan Africa combined (Mwakikagile 2009). This has contributed to climate change, the impacts of which are already being felt in the region with food insecurity, increasing risk of disease and the rising costs of extreme weather damage. The flares also contain widely-recognized toxins, such as benzene, which pollute the air. Local people complain of respiratory problems such as asthma and bronchitis. The flares contribute to acid rain and villagers complain of the rain corroding their buildings. The particles from the flares fill the air, covering everything with a fine layer of soot. Local people also complain about the roaring noise and the intense heat from the flares.

Various studies have been carried out on the impact of gas flaring on micro-climate and vegetation (Efe 2003), soil, air and water quality (Ekanem 2001), human health (Obajimi 1998, Oniero and Aboribo 2001) and on national economy (Oghifo 2001). No comprehensive study exists on the impacts of gas flaring on wildlife abundance especially in Ogba-Ogbema Area of Rivers State. Despite these efforts, more studies need to be done due to increasing concerns about short and long-term impact on wildlife. Thus a preliminary wildlife assessment, an aspect of environmental assessment (EA), was conducted to assess the impact of gas facilities on wildlife species abundance in Ogba-Egbema Area of Rivers State. This baseline studies was conducted within one week (6^{th}-15^{th} August, 2015), and aimed at assessing the impacts of gas flaring on the composition of wildlife species in Ogba-Egbema Area of Rivers State, Nigeria. The baseline data will ensure provision of qualitative and quantitative information on the present state of the environment impacted by gas flares. Data from the study sites will assist in the identification and assessment of the main effects that the gas companies have on wildlife and its associated environment.

METHODOLOGY

Area of study

The study was carried in five locations (communities) namely Obrikom (Lat. N $5^0 23.022'$ Long. E $006^0 39.0132'$), Mgbede (Lat. N $5^0 28.368'$ Long. E $006^0 43.681'$), Ebocha (Lat. N 5^0 $27.0801'$ Long. E $006^0 42.163'$) Aggah (Lat. N 5^0 $27.8'$ Long. E 006^0 $44.265'$) and Okwuzi (Lat. N 5^0 $29.008'$ Long. E 006^0 $42.656'$), all in Ogba-Egbema Local Government Area of Rivers State (Figure 1).

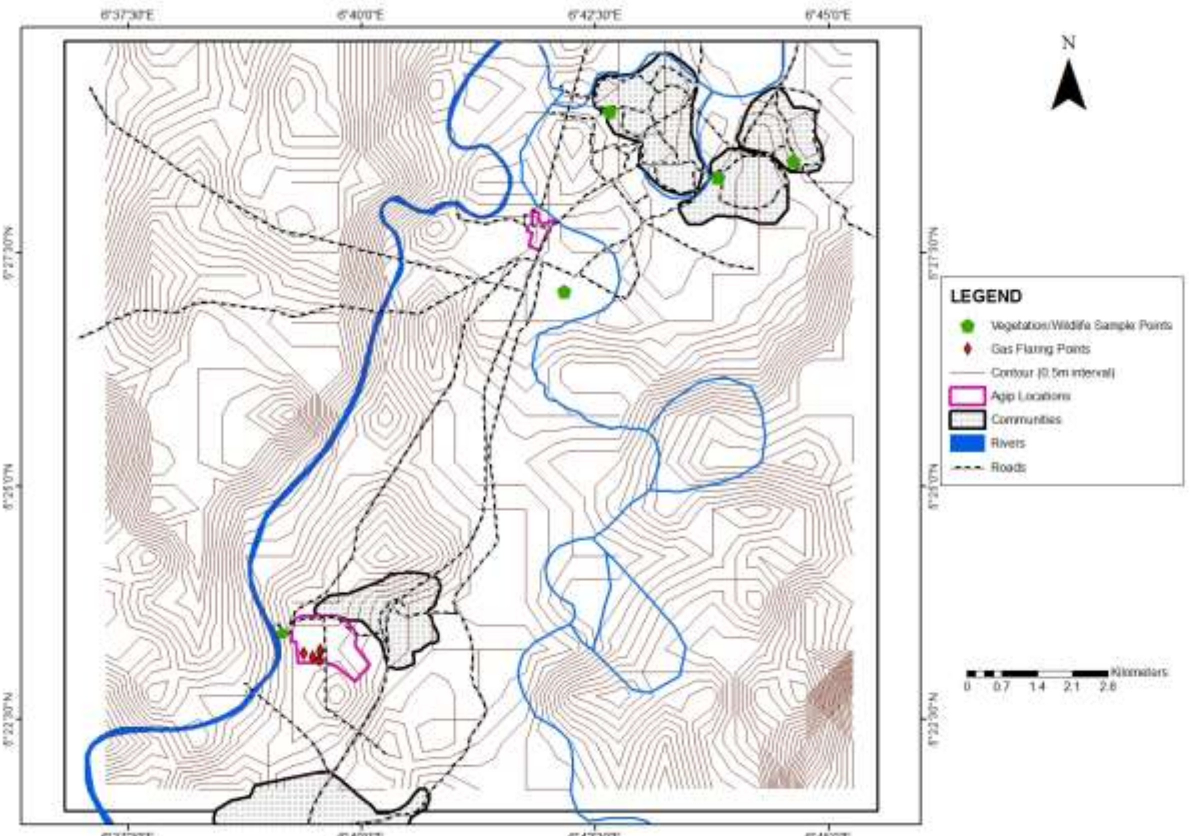

Figure 1: Map of the Study sites

Sampling method and data collection

With the aid of prismatic compass, two transects were established in each of the communities in areas likely to harbour wild animals. The sampling design was made in distance with 500m to 1000m transects (with north-south orientation) placed using the method described by Wanyama *et. al* (2010). A total of seven transects (each 15 m in width) were used for the study; two transects each in Obrikom and Aggah while one each in Mgbede, Ebocha and Okwuzi respectively.

Where species could not be sighted directly, indirect sightings in form of faecal droppings, footprints, songs, calls, burrows, nests and trails were estimated to measure abundance. Information was also sought from elderly locals who are very conversant with wildlife in the past and the present. Some information on nocturnal wildlife species were obtained in this way. Also, information on uses of wild animals and their products was obtained by direct interview with locals and some identified hunters. Most identification of mammals was done according to Kingdon (1997).

Data analysis

Data obtained from the study were used to estimate the density of the species. Estimate of density was computed using the following equation (Jayaraman, 1999):

$$D = \left[2\pi L^2 \sum_{i=1}^{n} \frac{x_i^2}{n^3} \right]^{-0.5}$$

Where D = Density of species, L = Total transect Length (km), x = Perpendicular distance (m), n = Number of observations.

The relative standard error or coefficient of variation (CV) of the density estimate was computed using the equation:

$$CV(D) = 100\sqrt{\frac{1}{n} + \frac{1}{2n}}$$

Also, the *Species Richness* (*d*), *Shannon-Wiener* (*H'*), *Evenness* (*E*) and *Simpson Dominance* (*C*) as described by Magurran (1988) were all used to analyse density data generated from the study.

RESULTS AND DISCUSSION

Population densities of wildlife species in oil communities of Ogba-Egbema, Rivers State

The impact of gas flaring and other related activities on wildlife communities as reflected in population densities of species in this study cannot be over-emphasised. The dwindling population densities of species are as a result of the state of the environment that has been ravaged by oil and gas exploration. Tables 1 and 2 show estimated population densities of some mammalian and reptilian species respectively while Table 3 shows the presence of avifauna species in the area of study.

As shown in Table 1, common mammalian orders identified during the survey are *Artiodactyla*, *Carnivora*, *Rodentia*, *Insectivora* and *Primata*.

Artiodactyla: The family *Bovidae* represented by Maxwell's duiker (*Cephalophus maxwelli*), bushbuck (*Tragelaphus scriptus*) and sitatunga (*Tragelaphus spekei*) had average densities of 0.030±0.004, 0.018±0.001 and 0.040±0.001 individuals/km^2 in the area of study. Only Okwuzi Community recorded the three species. This is due to the fact that some patches of secondary forest still exist in

Okwuzi which is located far away from the gas flaring points (Fig. 1). The communities of Obrikom (with many gas flaring facilities) as well as Aggah and Ebocha had no record of the species mentioned above. The combination of oil and gas exploration coupled with other anthropogenic impact has rendered the vegetation of the area inundated and caused dislocation to wildlife habitats.

Carnivora: Two *carnivora* families (*Viverridae* and *Felidae*) were encountered in the course of the survey. The African civet (*Civettictis civeta*) and wild cat (*Felis sylvestris*) with average densities of 0.022±0.002 and 0.044±0.012 individuals/km^2 respectively are among nocturnal wildlife species of the study sites. A major problem associated with gas flaring is *light pollution*. Light pollution subjects the wild animals especially the nocturnal ones around the vicinity of the flare to 24-hour daylight. This affects diurnality and night-time patterns in wild animals. The flares drive games away especially nocturnal animals, altering their feeding regime and other survival behavioural pattern. This may be responsible for the low average density of nocturnal carnivores in the study sites.

Rodentia: The giant pouch rat (*Cricetomys emini*), cane rat (*Thryonomys swinderianus*), marsh mongoose (*Atilax paludinosus*) and Stella wood mouse (*Hylomiscus stella*) with corresponding average densities of 7.336±0.068, 6.146±0.036, 0.008±0.002 and 0.012±0.002 individuals/km^2 respectively were the documented rodents during the survey. The densities recorded for the giant pouch rat and cane rat indicates that the species have the potentials of surviving harsh environments including gas polluted sites. For the cane rats, their major source of food (especially elephant grass) abounds in the study sites. Thus wildlife domestication projects involving giant-pouched and cane rats will be successful if embarked upon in the study area.

Insectivora: The Nigeria musk shrew (*Crocidura nigeriae*) is an insect eating rodent. The animal also feeds on other animal life like insects and earthworms. The average density of the species from this survey is 0.210±0.016 individuals/km^2. The low population density recorded in this study may be as a result of its eating habit of insects e.g. grasshoppers, crickets, beetles and aphids. Though insect population assessment was not carried out, gas and oil polluted environments have negative impact on insect populations. Gas flared environments are polluted with oxides of sulphur and hydrocarbons which are poisonous to insects. There is, therefore, a likelihood of food deficiency for insect eating mammals including the musk shrew. The trend, if not checked, may drive Nigerian musk shrew to local extinction.

Primata: The only primate family that is present at the study site is *Cercopithecidae*. The mona monkey (*Cercopithecus mona*) and putty-nosed monkey (*Cercopithecus nictitans*) are the only recorded species in study sites. The species are mainly diurnal and arboreal and live within palm plantations especially in Ebocha and Okwuzi axis. The species which exhibit relatively stable social groups feed entirely on forest fruits especially palm fruits, and live in troops of up to 12 individuals. The average densities for the species are 0.496±0.018 and 0.324±0.006 troop/km^2 for *Cercopithecus mona* and *Cercopithecus nictitans* respectively. The species are able to adapt to the study sites because of their foraging behaviour, feeding on any edible fruit available and also invading crop farms at the study sites. According to the local people, mona and putty-nosed monkeys often form polyspecific bands when invading farms and plantations.

Reptilia: Though other reptilian families may be present at the study sites, only four families were recorded during the survey as shown in Table 2. The family *Elaphidae* is represented by the Green mamba (*Dendroapsis viridis*), *Viperidae* by Gabon viper (*Bitis gabonica*), *Veranidae* by Nile monitor lizard (*Veranus niloticus*) and Agama lizard (*Agama agama*) while *Testudinae* by leopard tortoise (*Geochelonis pardalis*). The corresponding average densities are 0.014±0.006, 0.072±0.006, 0.018±0.004, 0.192±0.014 and 0.002±0.000 individuals/km^2 for green mamba, Gabon viper, Nile monitor lizard, Agama lizard and leopard tortoise respectively. Reptilian density in the study site is very low. Reptiles are very sensitive to any polluted environment due to their nature of feeding which is on the ground or very close to the ground. A contaminated soil simply means contaminated food for the species, and this will negatively affect species abundance.

Avifauna: Birds in general are good biological indicators of the environment and quickly sensitive to environmental index. Their abundance is directly proportional to the quality of the environment. The recorded species in this study can either be resident or migratory in nature. Among the thirteen families recorded, only the family *Ploceidae* was found to be in abundance. The *Ploceidae* is made up of weaver birds; the vittaline masked weaver (*Ploceus velatus*), slender billed weaver (*Ploceus luteolus*) and village weaver (*Ploceus cucollatus*) were all in abundance at the study sites. These species are adapted to man-made structures and gardens.

Table 1: Population density (individuals or troops/km^2) of some mammalian species at the study sites

Class	Order	Family	Common name	Scientific name	Obrikom	Agah	Mgbede	Ebocha	Okwuzi	Average density
Mammalia	*Artiodactyla*	*Bovidae*	Maxwell's duiker	*Cephalophus maxwelli*	-	-	-	-	0.15±0.02	0.030±0.004
			Bushbuck	*Tragelaphus scriptus*	-	-	-	-	0.09±0.03	0.018±0.001
			Sitatunga	*Tragelaphus spekei*	-	-	0.14±0.03	-	0.06±0.02	0.040±0.001
	Carnivora	*Viverridae*	African civet	*Civettictis civetta*	-	-	0.11±0.01	-	-	
		Felidae	Wild cat	*Felis sylvestris*	-	-	-	0.22±0.06	-	0.044±0.012
	Rodentia	*Cricetomyinae*	Giant-pouched rat	*Cricetomys emini*	7.63±0.04	8.81±0.03	5.05±0.06	10.60±0.12	9.64±0.15	7.336±0.068
		Thryonomidae	Cane rat	*Thryonomys swinderianus*	4.72±0.04	6.59±0.05	8.33±0.04	8.74±0.02	10.68±0.07	6.146±0.036
		Herpestidae	Marsh mongoose	*Atilax paludinosus*	-	0.04±0.01	-	-	-	0.008±0.002
		Muridae	Stella wood mouse	*Hylomiscus stella*	0.06±0.01	-	-	-	-	0.012±0.002
	Insectivora	*Tenrecidae*	Nigeria musk shrew	*Crocidura nigeriae*	-	0.49±0.02	-	-	0.56±0.06	0.210±0.016
	Primata	*Cercopithecidae*	Mona monkey	*Cercopithecus mona*	-	-	-	2.48±0.09*	-	0.496±0.018*
			Putty-nosed monkey	*Cercopithecus nictitans*	-	-	-	-	1.62±0.03*	0.324±0.006*

* = Troop density

Source: Field work (2015)

Table 2: Population density (individuals/km^2) of some reptilian species at the study sites

Class	Family	Common name	Scientific name	Obrikom	Agah	Mgbede	Ebocha	Okwuzi	Average density
Reptilia	*Elaphidae*	Green mamba	*Dendroapsis viridis*	0.03±0.01	-	-	0.04±0.02	-	0.014±0.006
	Viperidae	Gabon viper	*Bitis gabonica*	0.22±0.02	-	0.14±0.01	-	-	0.072±0.006
	Veranidae	Nile monitor lizard	*Veranus niloticus*	-	-	-	-	0.09±0.02	0.018±0.004
		Agama lizard	*Agama agama*	0.69±0.05	-	0.25±0.01	-	0.02±0.01	0.192±0.014
	Testudinidae	Leopard tortoise	*Geochelonis pardalis*	-	-	-	-	0.01±0.00	0.002±0.000

Source: Field work (2015)

Table 3: Presence of some avifauna species at the study sites

Class	Family	Common name	Scientific name	Obrikom	Agah	Mgbede	Ebocha	Okwuzi
Aves	*Accipteridae*	Black kite	*Milvos migrans*	+	+	-	-	+
		Hooded vulture	*Neophron monachus*	+	-	+	++	-
		Palmnut vulture	*Gypohielax angoleusis*	-	-	-	+	-
		Grey headed sparrow	*Passen griseus*	+	-	-	-	+
		Bush sparrow	*Petronin adentata*	-	-	+++	-	-
	Ardeidae	Little egret	*Egretta gazetta*	-	-	-	+++++	-
		Great white egret	*Egretta alba*	++	-	-	-	-
		Hammerkop	*Scopus umbretta*	-	-	-	++	-
		Grey heron	*Ardea cinerea*	+	-	-	-	++
	Ploceidae	Vittaline masked weaver	*Ploceus velatus*	-	*****	-	-	-
		Slender billed weaver	*Ploceus luteolus*	-	-	-	*****	
		Village weaver	*Ploceus cucollatus*	*****	-	*****	*****	-
	Bucerotidae	Grey hornbill	*Tockus nasutus*	-	++	++	-	-
		Black and white hornbill	*Tockus fasciatus*	-	-	-	+++	-
	Picidae	Pigmy wood pecker	*Verreauxia Africana*	-	-	-	-	+
	Nectaridae	Mouse brown sunbird	*Anthelpes gabonicus*	+	-	-	-	-
	Oriolidae	African golden oriole	*Oriolus ouralus*	-	-	-	-	++
	Estallididae	Whimbrel	*Numenius phaeopus*	-	+	-	-	-
		Common snipe	*Gallinago gallinago*	-	-	++	-	-
		Black tailed godwit	*Limosa limosa*	-	-	-	+	-
	Columbidae	Laughing dove	*Streptopelia senegalensis*	+	-	-	-	-
	Loquidae	Common tern	*Sterna hirundo*	+	-	-	-	-
	Picnonotidae	Common garden bulbul	*Pycnonotus babatus*	-	-	++	-	-
	Psittacidae	Grey parrot	*Psittacus erithacus*	-	-	-	+	-
	Jacanidae	Lilly trotter	*Actophilornis Africana*	-	+	+	-	-

+ = an individual sighted, ***** = more than 5 individuals sighted.

Source: Field work (2015)

Wildlife diversity Status

Diversity indices at the study sites for mammals, reptiles and avifauna are shown in Tables 4, 5 and 6 respectively. In the mammalian categories, the *Species Richness* (*d*) for Okwuzi (1.821) was significantly higher ($p \leq 0.05$) than other sites (Table 4). The *Shannon-Weiner* (H') value for both Ebocha (1.354) and Okwuzi (1.415) were significantly higher ($p \leq 0.05$) in the mammalian class (Table 4). In the reptilian category, there was no significant difference ($p \geq 0.05$) in *Species Richness* (*d*) but there was significant difference ($p \leq 0.05$) in *Shannon-Weiner* (H') values among the study sites (Table 5). For the avifauna categories, the *Species Richness* (*d*) computed was highest in Obrikom (2.889) and lowest in Aggah (1.835). The t-test carried out at 95% probability level for *Species Richness* (*d*) between the communities indicated that the value for Obrikom was significantly higher than those of other communities (Table 6). The values of *Shannon-Wiener* (H') for Obrikom, Mgbede, Aggah, Ebocha and Okwuzi were 1.835, 1.832, 1.295, 1.811 and 1.550 respectively (Table 6). The *Evenness (E)* and *Simpson's dominance* (*C*) indices for the study sites are clearly shown in Tables 4, 5 and 6.

Table 4: Summary of the Various Diversity indices computed for Mammalian species

Characteristic	Obrikom	Mgbede	Aggah	Ebocha	Okwuzi
Species Richness (d)	0.758^{a}	1.108^{a}	1.038^{a}	1.092^{a}	1.821^{b}
Shannon-Wiener Index ((H')	0.876^{a}	1.034^{a}	1.035^{a}	1.354^{b}	1.415^{b}
Evenness Index (E)	$0.797^{b,c}$	$0.746^{a,b}$	$0.747^{a,b}$	0.841^{c}	0.727^{a}
Simpson dominance Index (C)	0.459^{b}	0.120^{a}	0.157^{a}	0.287^{a}	0.314^{b}

Values followed by different superscripts are significantly different at 0.05 level of significance.

Source: Field Work, 2015

Table 5: Summary of the Various Diversity indices computed for Reptilian species

Characteristic	Obrikom	Mgbede	Aggah	Ebocha	Okwuzi
Species Richness (d)	1.820^{a}	1.443^{a}	-	-	1.820^{a}
Shannon Wiener Index (H')	1.099^{b}	$0.693^{a,b}$	-	0.347^{a}	1.099^{b}
Evenness Index (E)	1.000^{b}	1.000^{a}	-	-	1.000^{a}
Simpson dominance Index (C)	0.333^{a}	0.500^{a}	-	0.250^{a}	0.333^{a}

Values followed by different superscripts are significantly different at 0.05 level of significance

Source: Field Work, 2015

Table 6: Summary of the Various Diversity indices computed for Avifauna species

Characteristic	Obrikom	Mgbede	Aggah	Ebocha	Okwuzi
Species Richness (d)	2.889[c]	2.034[a,b]	1.668[a]	2.175[b]	2.055[a,b]
Shannon Wiener Index (H')	1.835[b]	1.832[b]	1.295[a]	1.811[b]	1.550[a]
Evenness Index (E)	0.835[a,b]	0.941[c]	0.804[a]	0.871[b]	0.963[c]
Simpson dominance Index (C)	0.234[a]	0.244[a]	0.355[b]	0.194[a]	0.225[a]

Values followed by different superscripts are significantly different at 0.05 level of significance

Ethno-zoological values of wildlife and their products

The ethno-zoological values of wildlife in the study area are shown in Table 7. About sixteen wildlife species and their products are recorded. For instance fat of python is used for the treatment of fractures and dislocation while a concoction prepared with white-bellied pangolin (*Manis tricuspis*) is used for extrusion of placenta after parturition, and also for preparing charms for good fortune. Many wildlife species are used to make ingredients in traditional healing and preventive medicine, and also for invoking and appeasing traditional deities, witches and wizards. Presently these species are not in abundance. This therefore, implies that many wildlife species are at the verge of local extinction due to the various uses to which they are put into in the study area. This is further aggravated by the level of pollution in the environment.

Table 7: Ethno-zoological uses of some wildlife species at the study sites

S/No.	Common name	Scientific name	Part used	Ailment/condition/purpose
1.	Bushbuck	*Tragelaphus scriptus*	Skull	Human skull fracture
2.	White bellied pangolin	*Manis tricuspis*	Whole female	Extrusion of placenta after parturition, good fortune
3.	African buffalo	*Syncerus caffer nanus*	Skin, eye balls, bones, liver	Elephantiasis, ear, nose and throat infection
4.	Nile monitor lizard	*Veranus niloticus*	Whole	Leprosy
5.	Mona monkey	*Cercopithecusmona*	Bones, intestines, penis and vulva	Strength and vitality for pregnant women, immunity against sexual poisoning
6.	Leopard	*Panthera pardus*	Skin	Snake poisoning
7	Hooded vulture	*Neophron monachus*	Whole	Good fortune
8.	Cane rat	*Thryonomysswinderianus*	Heart and liver	Strengthening bond between couple, aphrodisiac.
9.	African grey parrot	*Psittacus erithacus*	Whole egg	Good fortune, protection against witches
10.	African giant snail	*Archachatina marginata*	Whole	Aphrodisiac, high blood pressure
11.	African giant rat	*Cricetomys emini*	Whole tail	Appeasing traditional gods, prevention of accidents.
12.	Leopard tortoise	*Geochelonis pardalis*	Whole	Appeasing god of sex and potency for men
13.	Double-spurred francolin	*Francolinus bicalcaratus*	Feathers and bones	Fever
14.	African python	*Python sebae*	Head and fat	Head used for protection against witches.Fat used for treatment of dislocation and fracture
15.	Beecroft's hyrax	*Dendrohyrax dorsalis*	Whole leg	Prevention of accidents and bad luck
16.	Barn owl	*Tylo alba*	Whole body	Protection against witches

Source: Field Work, 2015

CONCLUSION AND MITIGATION MEASURES

It is evident from the report that the population density and richness of wildlife abundance is depleted, especially the mammals and reptiles which could not survive the harzardous environment. The avifauna, which had a record of thirteen families, had only the *Ploceidea* in abundance. This is because the *Ploceidea* adapt to man-made structures and garden. The few species of wildlife present in the study sites is due to adaptive nature of the animals. The lost of natural forest caused by anthropogenic factors like oil and gas activities, impacted negatively on the habitat of animals, which in turn resulted in low population densities of animal species in the study sites. The diversity indices measured indicate a clear evidence of urgent attention to redeem the conservation values of the study sites. The values of diversity indices obtained indicate that the wildlife conservation status of the study sites is almost lost.

There are numerous gas flares in the Niger Delta which cause substantial local damage without attracting notice from the regulatory authorities. The result of such incidents, though not quantified, has caused a decline in richness of wildlife abundance in gas and oil producing communities of Ogba-Egbema Area of Rivers State. At the impacted area, wildlife species that could not survive the hazardous environment either died or vacate the area for safer habitats. The general conclusion is that most wildlife species are disturbed for a period of time and then recover, though not at the same rate. The result is a period of ecological imbalance for wildlife communities. The types of indicator wildlife species available are important to make prediction on condition of ecosystem recovery.

Evidence from local people indicated that wildlife species are used for food, traditional medicine appeasing deities and fighting witchcraft in the study sites. Thus the threshold values of heavy metals deposit in the tissue systems of the species should be given serious attention, to assess and avoid the health hazard implication to human inhabitants in the area of study.

The renewable natural resources, including wildlife, at the study sites are needed to be conserved in order to balance the rate of loss and renewal. The benefits of wildlife are best attained when conservation areas like game reserves, wildlife sanctuaries and forest reserves are established. The significance of the oil producing communities of Ogba-Egbema area of Rivers State in biodiversity conservation are issues that can attract a lot of scientists and international funding to the area. Also a meaningful conservation programme at the area may increase the economic base of local inhabitants.

REFERENCES

Audu, E. B (2013). Gas Flaring: A Catalyst to Global Warming in Nigeria. International Journal of Science and Technology. Volume 3 No.1, January 2013. http://www.ejournalofsciences.org. Downloaded on January 20, 2016.

Efe, S.I. (2003). Effects of Gas Flaring on Temperature and Adjacent Vegetation in Niger Delta Environment. International Journal of Environment1(1): 91-101.

Egbon, O (2014). An exploration of accountability: evidence from the Nigerian oil and gas industry. A Thesis Submitted for the Degree of PhD at the University of St Andrews 25th September 2014. 296 pp

Ekanem, I.N. (2001). Effects of Gas Flaring on the Soil, Air and Water Quality of Obigbo North. Centre for Env. and Science Education. Lagos State University 153p.

Evoh, C. (2002). Gas Flares, Oil Companies and Politics in Nigeria http://www.waaso.org/environment/oil companies/gasflares politics.html.

Jayaraman, K. (1999). A Statistical Manual for Forestry Research. Food and Agriculture Organization of the United Nations (FAO) Regional Office for Asia and Pacific, Bangkok. Pp. 191-196.

Kingdon, J. (1997). The Kingdon Field Guide to African Mammals. A &C Black Publishers Ltd, London. 476pp

Magurran, A. E. (1988). Ecological Diversity and its Measurement. Chapman and Hall, London. 192 pp.

Mwakikagile, G (2009). A Profile of African Countries, Published by New Africa Press. Copyright. Pp 212.

Obadina, T. (1999). Nigeria's economy at the crossroads: new government faces a legacy of mismanagement and decay. Africa Recovery, United Nations. Available: http://www.un.org/en/africarenewal/vol13no1/nigeria1.htm (Accessed: 2012, June 29)

Obajimi, M.O. (1998). Air Pollution – A Threat to Healthy Living in Nigerian Rural Towns. In Current Issues in Nigerian Environment (A. Osuntokun ed) Ibadan: Davidson Press. p133-147

Oghifo, B. (2001). Nigeria Loses $6bn yearly to Gas Flaring. Nigerian Journal of Environment 24(3): 18-24.

Olukoya, S. (2008) Climate-Nigeria: Inefficient Gas Flaring Remains Unchecked. http://www.ipsnews.net/news. (accessed, 15 February 2009)

Oniero, S.B.R. and Abroibo, I (2001). EnvironmentalPollution: The Hidden Hand of Death in Warri Milieu. A paper presented at a Conference organized by Economic Department, Delta State University Abraka, 2000

Wanyama, F., Muhabwe, R., and Plumptre, A. J. (2010). Censusing large mammals in Kibale National Park: Evaluation of the intensity of sampling required to determine change. *African Journal of Ecology*, 48, 953-61.

ACKNOWLEDGEMENT

We wish to thank our major sponsor, the Gas Alert for Sustainable Initiative in the Niger Delta (GASIN), a Catholic-based environmental NGO responsible for creating awareness on the impact of gas facilities in oil and gas producing communities of the Niger Delta.